

"Experimental work has been done by a number of men, beginning with the great Claude Bernard, who in 1857 told of injecting CO into the right heart in dogs and finding sugar in blood and bile. (Lecons sur les Substances Toxiques, 1857, p. 161.) Richardson (Medical Times & Gazette, 1862, 1, 234) also experimented on dogs and found glycosuria after prolonged administration of CO. Richter (Deut. Med. Wchnschrft, 1895, p. 516) introduced CO intraperitoneally in rabbits and dogs and two hours later found sugar in the urine. More elaborate studies were made by Senff (Inaug. Diss. Dorpat. 1869) who worked with eleven dogs, getting positive results from all but one. Sugar appeared in the urine thirty to sixty minutes after the first inhalation, lasted about three hours reached 1.56 per cent to 4.24 per cent and was favored by low temperature. Albuminuria always went with it. Starving dogs do not have glycosuria. Araki (Ztschft. f. phys. Chemie, 1891 XV, 335) also found the phenomenon only in well-nourished dogs. He obtained it by exposing them to insufficient oxygen as well as to CO.

"Clinical observations are not very numerous. Munzer and Palma (Ztschft f. Heilkunde 1894, XV, 185) say it does not appear in mild CO poisoning. Von Jaksch (Prager med. Wchnschrft. 1882, VII, 161) says the amount is in proportion to the severity of the poisoning. He saw the sugar disappear from the urine in eight hours. Naunyn (Diabetes mellitus 1906) says marked glycosuria may follow slight CO poisoning. Ollivier (Bull. de l'Acad. de Med. 1889, 173) says that it is very rare. He himself saw only one case and Brouardel, with his wide experience, had never seen one. Maschke (Prager med. Wchnschrft. 1880, nr. 6) found sugar in the urine of two out of twelve bodies of persons dying from CO poisoning. Thomas Oliver (Diseases of Occupation, p. 70) describes one case, a man poisoned from a leaking gas main. In this case, the sugar in the urine persisted three or four days. On the other hand, John Glaister (Industrial Gas Poisoning, 1914) who had great experience with CO cases, never had anything but negative findings. Lewin (Die Kohlenoxydvergiftung, 1920) says the amount of sugar in the urine bears no relation to the severity of the poisoning. How frequent it is, nobody can say, for it is a test that is seldom made. In sixteen cases he found sugar eleven times, albumin three times. When present, it appears either almost at once, or three to five to nine hours later, or even not till the second or sixth day after. It lasts eight hours to twenty-four, rarely up to three days. The amount is usually 0.5 per cent to 2.0 per cent not over fifteen grams in twenty-four hours. Bloch (Inaug. Diss. Leipzig, 1902) studied fifteen cases of CO poisoning, four of them fatal. One of the four had glycosuria, five of the eleven that lived but in two of these, it was only a trace.

"Joslin, in his 'Treatment of Diabetes Mellitus' 1923, says nothing original, simply quotes Mann's article in the Proc. Am. Physiol. Soc. Dec. 1920, as saying that glycosuria, transient, is produced by asphyxia, ether, adrenalin and carbon monoxid poisoning."

I have, however, been able to find in a volume entitled "Kohlenoxydvergiftung" by L. Lewin (Julius Springe, Berlin, 1920) a chapter on carbon monoxid diabetes which contains a case report which I have translated as follows:

"A bricklayer who was fixing a flue, who inhaled chimney gases, and who was unconscious for three-quarters of an hour as a result of it, three days later had no sugar in the urine. After about three months 6 per cent of it was found besides acetone and diacetic acid, and the amount fluctuated between 4 per cent and 9 per cent in three to eleven litres of urine. The largest amount of sugar voided in one day was 660 grams. This was accompanied by great thirst. As singular as this occurrence in itself is, it is pos-

sible that its development is originally founded on the basis of a special disposition for the disease in the poisoning."

My patient applied for compensation on account of the occurrence of his diabetes following an industrial poisoning. His claim was denied. It seems to me entirely possible, however, that the diabetes did, in fact, arise out of the poisoning, and that the possibility of the occurrence of disturbances of carbohydrate metabolism should be borne in mind when cases of carbon monoxid poisoning are encountered.

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## AUTOTRANSFUSION USED IN A CASE OF RUPTURED SPLEEN

### REPORT OF CASE

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THIS case is reported: (1) to recall the great value and simplicity of autotransfusion in certain cases of massive internal hemorrhage. (2) To emphasize that slight trauma may easily rupture the spleen. (3) To record repeated consecutive blood findings, including red cell fragility tests and cholesterol determinations, before and after removal of an injured normal spleen.

### REPORT OF CASE

Admission 61077. The patient, a white male, age fourteen, student, was admitted to the surgical service of the Pasadena Hospital on October 9, 1930, and discharged on October 27, 1930.

**Chief Complaint.**—Nausea, vomiting, and pain in shoulder.

**Present Illness.**—He was perfectly well up until 4:15 p. m. of the day of admittance. He rode home from school with two companions, and was in the rear seat of the car when the car struck a "bump." He was thrown to the top, and fell in a "heap" on the floor of the car. His friends told him he was unconscious for five minutes. On gaining consciousness, he felt extremely weak and dizzy, and had a sharp pain in the upper left abdomen. He was taken home, undressed himself in spite of the extreme pain, and went to bed. His father noted that the boy was extremely pale and having cold sweats. Shortly after, he became nauseated and vomited a few times, the vomitus being free of blood. Feeling a desire to defecate, he arose from bed, went to the bathroom, had a copious movement (free of blood), but on attempting to return to bed he collapsed. On a second trip to the bathroom he fainted again. The nausea, vomiting, and pain continued. (The family had had nausea and vomiting the day previous, except the boy, due to poisoned food.) Pain in the shoulders, especially the left, and pain on deep breathing developed and became quite severe about 5 p. m. Then the pain, which had remained in the upper left side of the abdomen, suddenly shifted across the entire upper abdomen, and, a few hours later, to the right lower quadrant. He was seen about 7 p. m. and the parents were told that in all probability the boy had a ruptured spleen and would need immediate surgery.

**Examination.**—Temperature, 99 degrees; pulse, 112; respiration, 28. Urine: 1035, alkaline, amber, trace of albumin, sugar negative, occasional red blood cell. 9:45 p. m.—Blood: Red blood cells, 5,060,000; hemoglobin, 75 per cent; white blood cells, 14,780; polymorphonuclears, 92 per cent; lymphocytes, 6 per cent; transitionals, 2 per cent.

Date	HB	R. B. C.	W. B. C.	Polys.	Lymph.	Trans.	Nucleated reds	Morphology
10/10/30	71%	3,680,000	15,650	84	12	4		Anisocytosis { Polkilocytosis Marked polkilocytosis Acromia
10/11/30	65%		21,500	88	10	1		
10/12/30	62%		13,500	75	16	7		
10/13/30	59%	3,120,000	6,600	65	27	7	Few	{ Polychromatophilia Poikilocytosis acromia
10/18/30	56%		13,700	83	11	5	Few	
10/29/30	69%	4,150,000	13,250*	76	15	2	Few	

## Blood cholesterol determinations:

10/18/30 150 milligrams per 100 cubic centimeters  
 10/22/30 111 milligrams per 100 cubic centimeters  
 10/26/30 125 milligrams per 100 cubic centimeters

## Determination of fragility of red blood cells:

Initial hemolysis, 0.38 per cent sodium chlorid  
 Complete hemolysis, 0.28 per cent sodium chlorid

## Normal blood showed:

Initial hemolysis, 0.40 per cent sodium chlorid  
 Complete hemolysis, 0.32 per cent sodium chlorid

\* A few basophils, large monocytes, and eosinophils appeared on this date.

The patient was fairly well developed and nourished, conscious, rational, acutely ill, and in shock. The skin was pale, cold, and moist. The head gave no evidence of fracture. The pupils were regular, equal, and reacted to light and accommodation. The ears, nose, and mouth were negative. There was no rigidity of the neck. The chest showed equal expansion. The lungs were clear and resonant. Blood pressure, 112/80. The abdomen showed marked left rectus rigidity and tenderness when first seen. Later tenderness and rigidity was present across the entire upper abdomen and in the right lower quadrant. Splenic dullness was increased. No shifting dullness was elicited. The rectal examination was negative. The left shoulder was tender on palpation, but offered no evidence of fracture or dislocation. The reflexes were normal. X-ray examination was negative for radiographic evidence of injury.

**Operation.**—Ethylene gas anesthesia was used. High midline incision was used to open the abdomen. The abdominal and pelvic cavities were filled with blood. A laceration, apparently from the hilus, divided the spleen into two nearly equal parts. The lower pole was also lacerated. The exploration increased the hemorrhage and a transverse incision was quickly made to avoid further hemorrhage during mobilization of the spleen from its bed. The spleen was freed from the diaphragm, the pedicle was compressed by rubber-covered clamps and the spleen removed in the usual manner after the ligation of vessels. During the exploration and throughout the operation all blood in the abdominal and pelvic cavities was removed by aspiration into sterile bottles and citrated. Sixteen hundred cubic centimeters of blood containing 150 cubic centimeters of 2½ per cent sodium citrate solution was filtered (through sterile gauze to remove clots) and reintroduced into the median vein of patient's arm during the progress of the operation. One thousand cubic centimeters of normal saline solution by hypodermoclysis was also administered during the operation. The abdomen was closed in layers, using plain No. 2 catgut for peritoneum, and chromic catgut No. 2 for fascia. The introduction of silkworm figure-of-eight retention sutures and dermal skin sutures completed the operation.

**Subsequent Course.**—The patient reacted satisfactorily from anesthesia, but the pulse was increased to about 150 for two days and then gradually returned to normal on the sixth day. The temperature reached its highest point (103.5 degrees) on the second day, and then, by lysis, returned to normal on the fifth

day. On the second postoperative day, 500 cubic centimeters of citrated blood were administered. The urine was negative, except for traces of albumin and occasional red cells.

The blood picture can be followed in the accompanying chart.

The Wassermann and Kahn tests were negative. The patient left the hospital on the eighteenth day and returned to school during the fifth week.

**Comment.**—Autotransfusion has also been used in hemorrhage from ruptured tubal pregnancy, ruptured liver and lacerated intra-abdominal vessels, due to direct or indirect violence. It is recommended because of its simplicity and freedom from reactions, occasionally resulting from the use of foreign blood.

First Trust Building.

**Device Perfected to Standardize X-ray Treatment.**—Unification of all x-ray treatments throughout the United States, and possibly the entire world, is expected to result from the invention and development at the Bureau of Standards of an apparatus for standardizing the method of measuring x-ray "doses," it was stated orally September 17 on behalf of the x-ray section, Bureau of Standards.

Heretofore the various countries of the world have had different methods of measuring x-ray "doses," and attempts toward universal standardization have been largely unsuccessful because of the lack of proper equipment with which to conduct accurate comparisons, it was stated.

**Standards Necessary.**—The following information was furnished by the x-ray section:

In giving x-ray treatments for cancer, it is very necessary to carefully control the x-ray "dose" given the patient, just as the doctor must carefully regulate the amount of a drug that he administers. This is particularly important where it is necessary to give the greatest possible "dose" of x-rays, for, should the "dose" be too great, burns or more serious injuries might result.

Likewise, it is necessary for the doctors to use some standard "dose" so that it may be easily duplicated in all parts of the country and all over the world in order that their treatments may be reproduced and repeated. At present many doctors use small portable measuring instruments called dosage meters, and it is necessary that these be accurately calibrated.

The instrument developed by an associate physicist in the x-ray section of the Bureau of Standards, Lauriston S. Taylor, enables the accurate measurement of x-ray intensity. The method of measurement consists essentially in allowing an x-ray beam to pass between two metal plates, one of which is connected to a high voltage battery and the other to a sensitive measuring instrument capable of measuring a current of one one-hundred-billionth of an ampere. The x-rays cause the air between the plates to conduct electricity so that a very small electric current flows through this air and is measured by the sensitive meter. This small current of electricity is proportional to the intensity of the x-rays. Thus an accurate knowledge of the x-ray "dose" may be obtained by measuring this electric current.—*The United States Daily*, September 18, 1930.